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THE STATUS OF DEFOLIATOR INFESTATIONS
(Other than Spruce Budworm)
IN FOREST SERVICE REGION 4

By

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BRANCH OF FOREST INSECT AND DISEASE
PREVENTION AND CONTROL
DIVISION OF TIMBER MANAGEMENT

Forest Service
U. S. Department of Agriculture
Ogden, Utah

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INTRODUCTION

This report presents information regarding fourteen species of defoliating insects that were active in Forest Service Region Four during 1961, not including spruce budworm for which a separate report has been prepared.

Some of the defoliators described in this report have been problem pests in the region for considerable periods of time. Others are relatively new to the region or have not been active in the past few years.

In most defoliator infestations tree killing does not occur unless defoliation is severe and repeated from year to year. Loss from defoliator infestations occurs primarily as yearly increment reduction because of lowered tree vigor. For instance, from 1918 to 1925 the Pandora moth repeatedly attacked a stand of 400,000 acres of ponderosa pine in southern Oregon. Plots were established and growth measurements were made for 11 years. At the end of this period it was determined that the total growth loss as a result of repeated defoliation approximated 100,000,000 board feet. In areas important for recreation, esthetic values also are often severely impaired.

Defoliators such as the pine butterfly, the Pandora moth, aspen leaf miner, lodgepole needle miner, sawflies and many others are annually inflicting indirect losses to the region's forest resources.

It is the purpose of this report to present as accurately as possible the entomological interpretations of the more serious defoliator infestations occurring in Forest Service Region Four. In evaluating current defoliator conditions, entomologists have endeavored to consider all factors pertinent to any given infestation and to utilize this information in predicting present status, immediate or potential damage and possible course of the infestation.

Maps of the various infestations are appended.

LARCH SAWFLY

Payette National Forest

An infestation of larch sawfly, Pristiphora erichsonii (Hartig), was discovered in 1961 in Buckhorn, Cow Calf and Maverick Creeks on the Payette National Forest.

Investigators found a high level incidence of the larch sawfly pupae averaging 51.1 per square feet. Pupal rearings in the Ogden laboratory, however, showed a high percentage were parasitized. It is not known if the degree of parasitism will be sufficient to prevent surviving populations from becoming epidemic again in 1962. These infestations will be kept under surveillance to evaluate the effect of the parasites as well as other factors that influence population trends.

CALIFORNIA TORTISE SHELL BUTTERFLY PAINTED LADY (OR THISTLE) BUTTERFLY

Boise National Forest

Large flights of the California tortise shell, Aglais californica (Bdv.), and Painted Lady butterflies, Vanessa cardui (Linn.), migrated to the Boise and Payette National Forests during July. Many brush species, particularly, Ceanothus sp. were heavily defoliated.

THE PINE TUBE MOTH

Targhee National Forest

In August entomologists checked several areas on the Targhee National Forest in the Island Park country west of Yellowstone Park where forest personnel reported damage by a pine tube moth. The following conditions were found:

1. Several areas of lodgepole pine were found infested with a pine tube moth tentatively identified as Argyrotaenia pinatubana Kearf.
2. Damage was most severe on small trees, one foot and over, and pole sized trees up to 30 feet.
3. Damage consisted of webbing together of the needles and the larvae feeding on the needles of the "tubes" thus formed.
4. Ground and air detection surveys indicate that approximately 100,000 acres are currently infested with heaviest damage occurring around Squirrel Meadows on the Targhee National Forest.

This insect was epidemic near West Yellowstone through 1921-1925 and has persisted at a low level since that time until 1960 when population increased sharply on the Targhee National Forest. The increasing trend is expected to continue at least through next year. The affected areas will be checked periodically.

TUSSOCK MOTHS

Idaho City, Idaho

Ponderosa pine seedlings and brush species in and around Boise Basin Experiment Forest and the Town Creek plantation were defoliated by a tussock moth in 1959. As was predicted in 1960, the 1961 populations continued at epidemic levels. Defoliation of brush species such as willow, ceanothus, alder and others was noted from Idaho City to More's Creek Summit.

Aerial spraying of second and third instar larvae with DDT was done in early June on the Town Creek and Clay Creek plantations to protect planted ponderosa pine seedlings. A total of 1,200 acres was treated with good results.

This insect constitutes a threat to planted and natural ponderosa pine reproduction in the areas it infests. Brush species are the primary food, but when the supply is exhausted larvae migrate to surrounding stands of ponderosa pine where plantation and natural seedlings and small pole size trees are severely damaged. Large populations of tussock moths are expected to infest the brush species again next year.

Wheeler Peak, Nevada

Tussock moths infesting stands of white fir on the Humboldt National Forest, Nevada, appear to be at a low level. In 1959 epidemic populations of this insect were discovered on the Snake Range near Wheeler Peak. A polyhedral virus was applied aerially to 5,000 acres the spring of 1960. Establishment of the virus appears to be successful. Since that time epidemic populations have not been recorded in the treated areas.

Highland Peak (Pioche, Nevada)

All indications point to a continued downward trend of tussock moths in the Highland Peak area. Epidemic populations appear to have been controlled by egg parasites and a native virus that caused considerable larval mortality.

LODGEPOLE NEEDLE MINER

For the fifth consecutive year lodgepole needle miner, Evagora milleri Busck., populations continue at epidemic levels in many lodgepole pine stands of Forest Service Region Four.

Ashley National Forest

An infestation on the Ashley National Forest covers approximately 40,000 acres in the Greendale Junction area. This infestation has been active for about three years; however, this year for the first time it became visible from the air.

Damage density figures taken in July 1961 show nearly 100 percent of all needles affected except those produced in 1961. 70 percent of the damage was caused by the needle miner and the remainder by a pathogen, probably needle cast. Heavy populations of needle miners were present; however, parasitism of these individuals ran as high as 50 percent. Spring evaluations to determine brood density and parasitism rates will have to be made before the infestation trend can be established.

Targhee National Forest

The large infestation that has been active for several years north of Ashton, Idaho, persists on over 100,000 acres. For the past five years populations have fluctuated from high endemic to epidemic. Throughout the history of this infestation, entomologists have observed a constant spread north and eastward, and it is now approaching the western border of Yellowstone National Park.

Heaviest defoliation occurs around Moose Creek Butte. Aerial estimates record 40 to 80 percent damage on approximately 2,000 acres. This area lies about five air miles east of an old infestation center around Big Falls on Henry's Fork of the Snake River.

Ground evaluations point up the following: (1) Damage levels within the main infestation appear to be fluctuating from year to year with regard to defoliation, and (2) populations appear to be less severe than observed last year in the large epidemic area. A definite spread to the north and east was evident.

Two other needle miner infestations, Bear Gulch and McGarry Canyon, continue at epidemic levels. The Bear Gulch infestation is a complex of lodgepole needle miner, Dioroctria, and a budworm. Defoliation continues at about the 70 to 80 percent level. The infestation appears to be increasing in size. In McGarry Canyon adjacent to Bear Gulch the same trio of defoliators continue to feed on lodgepole pine foliage at about the same level as last year, that is, 50 to 60 percent of the green foliage was destroyed each year. The spreading tendency was not evident in this infestation.

Budworm, Dioryctria, and lodgepole needle miner infestations were also recorded to be occurring simultaneously last year on approximately 2,000 acres in Little Cottonwood and Little Creeks. Entomologists found an average of 10 percent of the 1959 foliage damaged in 1960. This year needle miners defoliated 10 to 15 percent of last year's needles. No major change in defoliation pattern was noted; however, the general trend points toward an increase in the size of the infested area.

A new lodgepole needle miner infestation was found in old mountain pine beetle epidemic centers around Sheridan Reservoir. Budworm and Dioryctria were associated with needle miner populations. At present these defoliators are causing about 40 percent accumulative defoliation to year-old foliage.

Other areas of lodgepole needle miner activity covered in last year's report are static or declining.

Bridger National Forest

The small 10 acre infestation of lodgepole needle miner in Call Creek appears to be declining. Last year 60 percent of the year old needle complement had been defoliated. This year 30 percent and less of the year-old needles had been mined.

Another damage area which appears to be due to lodgepole needle miner activity was detected by aerial survey personnel between the towns of Grover and Turnerville on the Wyoming Division of the Bridger National Forest. Approximately 1,500 to 2,000 acres of 10 to 40 percent defoliation was recorded. Ground evaluations will be made this winter or in the spring of 1962.

Other Areas

Light infestations of lodgepole needle miner were reported last year in Eagle Creek of the Caribou National Forest and on the Cassia Division of the Sawtooth National Forest. Both infestations appear to be static or declining in 1961.

ASPEN LEAF MINER

This year the aspen leaf miner (Phyllocnistis populiella Chamb.) continued at a high level of activity. Considerable deformity with some mortality is occurring in Grand Teton National Park and Teton, Bridger and Targhee National Forests. Infestations have existed in these areas for over 14 years. The aspen leaf miner is becoming more active in aspen stands on portions of the Caribou National Forest.

Aerial detection surveys in Utah during 1961 showed defoliation on the Uinta and Ashley National Forests. For the most part the leaf miner is not wide-spread on these forests but shows a tendency to increase.

Predators, parasites and other biological control agents do not appear to be holding aspen leaf miner populations in check. The prediction is static to increasing tendencies for all of the infestations. Currently no effective control measures have been devised for large scale infestations.

PANDORA MOTH

The Pandora moth, Coloradia pandora Blake, that was detected in lodgepole pine stands in 1959 continues to persist on the north slopes of the Uinta Mountains. Entomologists have kept the area under surveillance and 1961 fall surveys show that the infestation has increased in size to over 67,000 acres. No areas of heavy defoliation were observed, however, and overall feeding activity appeared to be less than in 1959. Defoliation ranged from about 10 percent to slightly above 30 percent. The heaviest defoliation recorded in 1961 was on an area about one and one-half miles south of Browne Lake. In this area (about two square miles) defoliation averaged slightly more than 60 percent. The heavier defoliation occurred in a direct line from the old infestation toward Vernal, Utah. Literally thousands of adult moths migrated in this direction in 1960, and it is possible that light attraction is partially responsible for the shift in the area of heaviest infestation from Half Moon Park to south of Browne Lake.

In July of 1961 larval density averaged 10 or less individuals per tree which is a considerable reduction over the 50 per tree that were found in 1959. Reduction in numbers of pupae per square foot of soil was also noted in 1961.

The Pandora moth has a number of parasites and predators associated with it at various stages of its life cycle. Also, a wilt disease, when present, causes heavy larval mortality. These factors were probably responsible for much of the reduction in Pandora moth populations on the Ashley National Forest.

The Pandora moth has not attacked adjacent stands of ponderosa pine. Past history in other regions shows that ponderosa pine is a preferred host.

PONDEROSA PINE NEEDLE MINER

Ashley National Forest

Moderate to heavy populations of ponderosa pine needle miner, Evagora moreonella Hein, are infesting approximately 19,000 acres of ponderosa pine on the Ashley National Forest and adjoining private lands. The

main infestation center is located around Greendale Junction in the Flaming Gorge Dam area. Relatively little damage was noted in 1960-1961 needles; the majority of the defoliation occurring as loss of 1955 to 1958 needles. About 50 percent of the affected needles were mined by the ponderosa pine needle miner. Damage to the remaining 50 percent was due to undetermined factors.

Degree of stand damage is highly variable throughout the infested area. In the infestation center around Greendale Junction nearly 80 percent of the ponderosa pine trees in the stand were affected in some degree. Damage samples taken in late July after feeding was completed showed an average of less than 5 percent defoliation over the entire infestation. Larval populations in late June averaged 94.8 individuals per 15 inch twig sample.

This insect has one generation annually with the adult moths flying and laying eggs between July and August. Severe damage in 1962 is not likely unless population survival is higher than predicted.

ASPEN LEAF TIER

Fishlake and Manti-LaSal National Forests

During 1961 several outbreaks of aspen leaf tier were reported on the Fishlake National Forest in southern Utah. Entomologists found defoliation in aspen stands that ranged from 20 to 100 percent with an overall average of approximately 40 to 50 percent. These are the heaviest infestations of leaf tier ever recorded in Region Four.

Populations were in the pupal stage at the time of ground investigations and collections were made and the specimens returned to the laboratory for rearing and identification. Identification work was not completed at the writing of this report.

Several species of Hymenopterous and Dipterous parasites along with Hemipterous predators were found throughout the infested area. Further surveys will be needed to determine what, if any, effect these forms will have in exerting natural controls on leaf tier populations.

Aerial survey personnel detected additional suspected leaf tier damage on the LaSal Division of the Manti-LaSal National Forest, but no ground check was made in this area.

It can be assumed that repeated moderate to heavy defoliation will eventually cause some mortality in the affected aspen stands.

SPRUCE MEALYBUG

Dixie and Fishlake National Forests

Spruce mealybug (Puto sp.) infestations are still active in southern Utah on Barney Top and Griffin Springs, Dixie National Forest, and Thousand Lake Mountain near Loa on the Fishlake National Forest.

The Fishlake infestation (Thousand Lake Mountain) was first reported in 1939 and the Dixie infestations (Barney Top and Griffin Springs) were found in 1955. Observations this year on the Fishlake National Forest showed tree mortality was becoming increasingly noticeable. Most of the mortality is occurring in reproduction in cutover areas. Older trees in infested spruce stands have green needles only in the upper crown.

Last year, it was predicted that some tree mortality could be expected in the Barney Top, Griffin Spring areas if the infestation persists. Observations made this year substantiate this prediction but current mortality is light.

The spruce mealybug is expected to continue at its present high level of activity unless some unpredictable biological or climatic factors adversely affect the populations.

Basic work on the life cycle and general developmental history of the mealybug is now completed. Plans are underway for work on population trends and damage estimates.

A POPLAR LEAF BLOTCH MINER

A leaf blotch miner tentatively identified as, Phyllonorycter tremuloidiella Braun, was active in and around Zion National Park. Principal species affected were aspen and cottonwoods. Damage from this insect was most severe in the lower 50 feet of the crown. Leaves are prematurely shed when attacked. Approximately 10 percent of the foliage was destroyed in 1961. Unless substantial population increases occur in 1962, it is doubtful that direct control measures will be needed in the affected areas.

SCALE IN PINYON PINE

A scale insect, Matsucoccus acalyptus Herbert, has been causing increased damage to pinyon pine stands in Utah and Nevada for the past five to six years. Several areas in the two states were investigated to determine the status of this insect. Altogether there are several hundred thousand acres of pinyon pine supporting epidemic populations of the scale. Most of the infestations occur in southwestern Utah and southeastern Nevada. Christmas tree harvest near the following towns could be affected: Beaver, Utah; Panguitch, Utah; Cedar City, Utah; Paragonah, Utah; Baker, Nevada and Pioche, Nevada.

In the Utah areas defoliation has ranged from 30 to 50 percent. The Nevada pinyon pine stands have been 90 to 100 percent defoliated. In both areas it has been noted that the trees appear to be dead in late August and early September, but new foliage has appeared yearly. Tree mortality is as yet limited.

Repeated yearly feeding may in time cause tree mortality. One case has been observed where Ips sp. attacked trees severely defoliated by the scale. About 100 pinyon pines were killed near Lehman Caves National Monument, Nevada.

Continued accelerated defoliation of pinyon pine stands in Utah and Nevada is expected at least through next year as a result of M. acalyptus feeding.

PINYON PINE SAWFLY

Populations of the pinyon pine sawfly, Neodiprion eduliculus Ross, appear to be on the increase. Stands near Pioche, Nevada, showed about 10 percent defoliation on the outer edges and 75 to 95 percent defoliation near the infestation centers.

Last year unfavorable bioclimatic factors and parasitism held the pinyon pine sawfly to a relatively low level activity. The reverse of this situation appears to have occurred in 1961 and populations once again show an upward trend. An increase to epidemic levels would adversely affect Christmas tree harvest in this area.

DISCUSSION

Forest Service Region Four was beset with a variety of defoliating insect species in 1961. Damage was not confined to coniferous stands; broad leaved species such as aspen and cottonwoods were severely defoliated in many areas. In addition, many brush species including Ceanothus sp. alder and willow were attacked.

For the most part current populations of defoliators are such that direct control measures are not indicated for the 1962 field season. the one exception is spruce budworm which is covered in a separate report.

This report does not include detailed biological evaluation data. The foregoing summaries have been condensed from such data which included population density figures, effects of pathogens, stand conditions, predator and parasite influences, bioclimatic conditions and other relative factors which might enhance or adversely affect any given defoliator infestation.

Stand mortality as a result of defoliator feeding is rather limited. Damage occurs principally as loss of growth from reduced vigor in the host species. An exception is noted, however, in the aspen stands of Idaho and Wyoming where increased yearly mortality is occurring due to repeated attacks of the aspen leaf miner. Also, the spruce mealybug in southern Utah spruce stands has caused severe limb killing and some tree mortality.

Even though defoliators do not produce the sudden dramatic death that bark beetles do, they nevertheless constitute a continuous drain on forest resources. Entomologists will continue to keep all known outbreaks under surveillance so they will be in a position to detect changes in trend and potential.

KEY TO DEFOLIATOR INFESTATIONS

<u>Insect</u>	<u>Host</u>
1. Larch sawfly	Larch
2. Tussock moth	Ceanothus Bitterbrush White fir
3. California tortoise-shell butterfly and painted lady butterfly	Ceanothus
4. Pine tube moth	Lodgepole pine
5. Lodgepole pine needle miner	Lodgepole pine
6. Aspen leaf miner	Aspen
7. Pandora moth	Lodgepole pine
8. Ponderosa pine needle miner	Ponderosa pine
9. Aspen leaf tier	Aspen
10. Mealybug, <u>Puto</u> sp.	Engelmann spruce
11. Poplar leaf blotch miner	Poplars
12. Pinyon pine scale	Pinyon
13. Pinyon pine sawfly	Pinyon





